

1. Let

$$f(x) = \begin{cases} \sqrt{9-x^2} & \text{if } -3 \leq x \leq 0 \\ 3-6x & \text{if } 0 \leq x \leq 1 \end{cases}$$

Evaluate $\int_{-3}^1 f(x)dx$ by interpreting the integral as a difference of areas.

2. Find the derivative of the function $F(x) = \int_{x^2}^1 \frac{1}{\sqrt{1+3t^2}} dt$.

3. Evaluate the following:

a. $\int \left(x^2 - \frac{1}{2x} + \frac{1}{x^2} + \cos x \right) dx$

b. $\int (x^3 + 3^x + 3^3) dx$

c. $\int \frac{-3}{1+16x^2} dx$

d. $\int \frac{5x^2 - 2x + 1}{\sqrt{x}} dx$

e. $\int x^3 e^{3x^4 - 2} dx$

f. $\int \frac{6x}{3x^2 + 1} dx$

g. $\int \sin(2x+1) dx$

h. $\int \sec^2(\pi x) dx$

i. $\int_2^4 \frac{1}{4-3x} dx$

j. $\int_{1/2}^{3/2} 2\cos(\pi x) dx$

k. $\int_0^1 \frac{1}{1+x^2} dx$

l. $\int_{-3}^2 \frac{1}{(x+5)} dx$

m. $\int \frac{e^{\sqrt{x}}}{\sqrt{x}} dx$

n. $\int_{-1}^1 \frac{2^x}{4^x} dx$

o. $\int_0^{\pi/4} \tan x \sec^2 x dx$

4. Estimate the area from $x=0$ to $x=2$ under the graph of $f(x)=x^2$, using the Riemann Sum with $n=4$ and the midpoints.
 5. Find the average value of $f=(e^x)^2$ from $x=-1$ to $x=1$.
 6. Find the area of the region bounded by the curves $y=|x|$ and $y=x^2-2$.
 7. If f is continuous and $\int_4^{12} f(x)dx = 4$, find $\int_1^3 3f(4x)dx$.
 8. Write a single integral in form $\int_a^b f(x)dx$: $\int_{-2}^2 f(x)dx + \int_2^5 f(x)dx - \int_{-2}^{-1} f(x)dx$
 9. Evaluate $\int_0^4 |\sqrt{x}-1| dx$
10. Find the area of the region bounded by the curves $y=\sin x$, $y=\cos x$ for $x=0$ to $x=\pi$.